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ANXIETY AND MOTIVATION AS FACTORS IN INHIBITORY POTENTIAL.

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THE HYPOTHESIS THAT THE ANXIETY LEVEL OF SUBJECTS WILL AFFECT THEIR TENDENCY TO ACCUMULATE REACTIVE INHIBITION WAS TESTED. THE STUDY EMPLOYED THE CHILDREN'S MANIFEST ANXIETY SCALE TO IDENTIFY 120 HIGH AND LOW SCORERS AND AN INVERTED-NUMBER PRINTING TASK TO QUANTIFY REACTIVE INHIBITION. THE HYPOTHESIS WAS PARTIALLY CONFIRMED. WITH HIGHLY MOTIVATING INSTRUCTIONS, HIGH ANXIETY SUBJECTS ACCUMULATED MORE REACTIVE INHIBITION THAN LOW ANXIETY SUBJECTS, BUT WITH LOW MOTIVATION, THE HIGH AND LOW ANXIETY GROUPS DID NOT DIFFER. ANXIETY LEVEL APPARENTLY BECOMES A POTENTIAL DETERMINER OF INHIBITORY POTENTIAL ONLY AFTER A CRITICAL LEVEL OF MOTIVATION HAS BEEN REACHED. THIS PAPER WAS PRESENTED AT AN ANNUAL MEETING OF THE AMERICAN EDUCATIONAL RESEARCH ASSOCIATION (CHICAGO, FEBRUARY 1966). (JH)

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ANXIETY AND MOTIVATION AS FACTORS IN INHIBITORY POTENTIAL

(A Paper Presented at the annual American Educational Research Association Annual Meeting, Chicago, February, 1966)

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Anxiety and Motivation as Factors in Inhibitory Potential

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A paper presented at the annual
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Abstract

The hypothesis that subjects' anxiety level will affect their tendency to accumulate reactive inhibition was tested. The study employed the Children's Manifest Anxiety Scale to identify 120 high and low scorers and an inverted-number printing task to quantify reactive inhibition. The expectation was partially confirmed. With highly motivating instructions, high anxiety subjects accumulated more reactive inhibition than low anxiety subjects; but with low motivation the high and low anxiety groups did not differ. Anxiety level apparently becomes a potential determiner of inhibitory potential only after a critical level of motivation has been reached.

Anxiety and Motivation as Factors in Inhibitory Potential[1]

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According to Hullian theory a tendency to accumulate reactive inhibition rapidly would have a decremental effect upon reaction potential. Thus, it has been argued (Lynn, 1960) that if Peel's (1956) theory that acquiring basic school skills is a matter of conditioning is correct, the pupils who learn these skills readily should generate reactive inhibition slowly. Several studies (Lynn, 1960; Otto & Fredricks, 1963; Otto, 1965; Otto, in press) support the prediction: With a fairly low level of motivation elementary pupils who were good achievers in reading, handwriting and spelling tended to accumulate reactive inhibition more slowly than poor achievers.

Wasserman (1951) reasoned that with high motivation there should be a rise in the critical (tolerable) level of reactive inhibition necessary to produce the automatic resting response; and his highly motivated subjects did show increased performance and greater accumulation of reactive inhibition. However, recent findings with good and poor achievers only partially support Wasserman's prediction. The data (Otto, 1965) yield some evidence that both the performance and the inhibitory potential of good achievers are increased when motivation (intrinsically or extrinsically induced) is increased; but no such relationship is demonstrated with poor achievers. The reason for the latter is not clear; but an hypothesis that ostensibly motivation producing instructions may have differential effects upon good and poor achievers seems defensible (Van De Riet, 1964).

In the present study the subjects were elementary pupils who scored high or low on an anxiety scale. Anxiety is, in the present Hullian framework, considered a learned drive of considerable potency, so high anxiety subjects ought to produce more work and accumulate more reactive inhibition than low anxiety subjects in a given period of time. One purpose of the study was simply to test the validity of the prediction. A second purpose was to examine the effect of different levels of motivation (equated to instructions employed, as in the earlier study). The notion was that, just as with the good and poor achievers in the earlier study, different motivation levels might produce different results with high and

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low anxiety subjects. Such a finding would, of course, support further speculation regarding the possible differential effects of motivation level upon the performance of good and poor achievers.

Method

Subjects and Design

Subjects were chosen from Grades 4, 5 and 6 (13 classrooms) of an all-white rural-suburban county elementary school. The Children's Manifest Anxiety Scale (CMAS) was administered to all of the children by their regular classroom teachers. The experimenter met with each teacher and provided written directions in order to standardize the testing procedures and to assure that every attempt was made to evoke truthful answers to the scale items.

Table 1 is a summary of the CMAS results. In general the present scores were higher than the scores obtained by the fourth, fifth and sixth graders in the original standardization study (Castanada, McCandless & Palermo, 1956). For purposes of this study children who scored with the upper 20% were considered high in anxiety and those who scored with the lower 20% were considered low in anxiety. Subjects were chosen at random from the high and low anxiety groups at each grade level.

Table 1
CMAS Scores of Selected Percentiles

Grade	Percentile		
	20	50	80
4(N=147)	16*	23	29
5(N=137)	14	21	31
6(N=114)	13	21	28

*All scores are rounded to the higher whole number

The study comprised two replications of the basic design, first with low motivation and second with high motivation. (There was no overall design because the decision to replicate with high motivation came after the low motivation subjects had been run.) Ten high anxiety and 10 low anxiety subjects from each grade level--4, 5 and 6--served in each replication.

Task and Procedure

The details of the inverted number-printing task as a measure of reactive inhibition are described elsewhere (Otto and Fredricks, 1963). Briefly, the experimenter put the inverted numbers from 1 to 10 on a chalkboard while the subjects attempted to make the inversions on their own. When the task was clearly understood, subjects were given instructions assumed to evoke

either high or low motivation (see below) for the task. Subjects were then told to print inverted numbers in the 1/2-inch squares on their data sheets as quickly as possible. They were given 12 massed 30-second trials, a 5-minute rest, and 4 more massed 30-second trials. The assumption is that reminiscence (the gain in postrest over prerest performance) reflects the amount of reactive inhibition dissipated.

The instructions employed in the two phases of the study are designated "high" or "low" motivation instructions more for convenience than for the descriptive propriety of the terms. In previous studies (Otto & Fredricks, 1963; Otto, 1965) two sets of instructions were devised. First the aim was merely to secure reasonable motivation without producing anxiety: Subjects were assured that they were not being tested in the usual sense, but that what they did would be useful in "showing how children learn." Later the aim was to increase extrinsic motivation: Subjects were told that they should work with all possible speed because the number of digits they produced would reflect their general intelligence and learning ability; the implication was that the task was a "test" on which it was important to do well for personal reasons. The former, then, are arbitrarily termed "low" and the latter "high" motivation instructions. There is evidence from the previous studies that the instructions do in fact make a difference, at least with good achievers.

Subjects were run in groups of 5 to 15. Two experimenters were always present to insure accurate timing and to supervise the activity. Each group was asked not to discuss the task until the experimenters had left the school in order to preclude pretest practice.

Results

Statistical tests revealed no significant differences in the number of digits produced by any group on successive trials (Trial 1 versus Trial 2, Trial 2 versus Trial 3, etc.), so selected trials only were considered in subsequent analyses. Mean inverted numbers printed on selected trials with high and low motivation and F values resulting from comparisons by simple analyses of variance of high and low anxiety groups' performance on respective trials are given in Table 2.

Table 2
Mean Numbers Printed and F Values
for Selected Trials (By Motivation Level)

Motivation and anxiety levels		Trial						
		1	5	8	12	Rest	13	16
Low	High	8.00	7.63	8.43	10.00	----	12.57	11.37
Low	Low	7.53	7.37	8.47	9.40	----	11.90	9.80
	F	.38	.09	.00	.63	----	.41	2.35
High	High	7.77	7.20	8.83	7.70	----	13.90	11.30
High	Low	9.00	9.27	8.87	9.80	----	14.17	10.70
	F	2.16	5.23*	.00	7.25**	----	.06	.39

*p<.05
**p<.01

The data show that with low motivation high and low anxiety groups' performance did not differ on any trial. With high motivation there was no significant difference in initial performance, but by the last prerest trial the groups differed substantially; after rest and assumed dissipation of reactive inhibition there was, again, no difference.

Repeated measures analyses of variance (Edwards, 1950) of numbers printed on first and last prerest trials (acquisition) and on last prerest and first postrest trials (reminiscence) are summarized, for low motivation groups, in Table 3 and, for high motivation groups, in Table 4.

Table 3
Analysis of Variance for Acquisition
and Reminiscence Trials with Low Motivation

	Trial 1 versus Trial 12			Trial 12 versus Trial 13		
Source	df	MS	F	df	MS	F
Grade (G)	2	39.11	3.49*	2	76.16	4.28*
Anxiety Level (A)	1	8.53	----	1	12.03	----
G x A	2	39.91	3.56*	2	62.56	3.52*
Ss/Group	54	11.22	2.84***	54	17.79	3.39***
Trial	1	112.13	28.39***	1	192.53	58.34***
T x G	2	6.41	1.62	2	11.61	3.52*
T x A	1	.13	----	1	.03	----
T x G x A	2	2.31	----	2	6.01	1.82
Ss x T/Group	54	3.95	----	54	3.30	----

*p<.05
***p<.005

Table 4
Analysis of Variance for Acquisition
and Reminiscence Trials with High Motivation

	Trial 1 versus Trial 12			Trial 12 versus Trial 13		
Source	df	MS	F	df	MS	F
Grade (G)	2	44.81	3.22*	2	88.03	4.25*
Anxiety Level (A)	1	83.33	6.27*	1	42.01	2.03
G x A	2	.76	----	2	21.03	1.02
Ss/Group	54	13.93	2.88***	54	20.70	5.16
Trial	1	4.03	----	1	837.41	208.83***
T x G	2	4.01	----	2	7.63	1.90
T x A	1	5.63	1.16	1	25.21	6.29**
T x G x A	2	15.26	3.16	2	2.03	----
Ss x T/Group	54	4.83		54	4.01	

*p<.05
**p<.01
***p<.005

For subjects with low motivation instructions, significant Grade and Trial main effects indicate that subjects' performance differed by grade level and that performance changed across acquisition and reminiscence trials. The Trial x Grade interaction on reminiscence trials suggests that postrest gains also differed by grade level; and the Grade x Anxiety Level interactions indicate that performance by grade level groups was affected by anxiety level. Most pertinent to present concerns, however, is the lack of both a significant Anxiety Level main effect and an Anxiety x Trial interaction. The suggestion is that with low motivation the anxiety levels of the present subjects had no predictable effect upon total performance or accumulation of reactive inhibition.

With high motivation instructions subjects performed differently. As with low motivation, Grade was a significant main effect and Trial was significant at the reminiscence stage. Before rest (acquisition trials), however, Trial was not significant but Anxiety Level was. The data in Table 2 serve to clarify: high and low anxiety subjects' performance did not change much over acquisition trials, but the low anxiety subjects produced more inverted numbers. After rest (reminiscence trials) Anxiety Level was again not significant (high and low anxiety subjects did not differ in total inverted numbers produced on Trials 12 and 13 combined); but Trial was highly significant, indicating a change over reminiscence trials. Here the significant Trial x Anxiety Level interaction serves to clarify: the high anxiety subjects made greater postrest gains than the low anxiety subjects. The suggestion, then, is that the high anxiety subjects dissipated more reactive inhibition during rest. However, the subsequent implication that high anxiety subjects accumulate reactive inhibition more rapidly is not supported by a significant Trial x Anxiety Level interaction.

Discussion

The prediction that high anxiety subjects will produce more work and accumulate more reactive inhibition than low anxiety subjects in a given period of time is neither clearly supported nor rejected by the present data. Instead, it appears that anxiety level becomes potent only after a critical level of motivation has been reached. The present high motivation instructions seemingly produced motivation beyond the critical level; but the data offer no means for locating this point on a centinuum. Further investigation is needed to clarify the nature of the interaction between anxiety level and (what we have rather arbitrarily termed) motivation level.

Considering only the high motivation group, then, the prediction still is not fully supported. The high anxiety subjects did not produce more inverted numbers than low anxiety subjects; instead the latter group produced significantly more before rest. Yet the high anxiety subjects did, as predicted, dissipate more reactive inhibition during rest; and the implication is that they accumulated more reactive inhibition because they worked harder (rested less) during the massed trials, despite their relatively poor showing.

While this seems paradoxical, a reasonably straightforward explanation can be suggested: Given highly motivating instructions, high anxiety subjects' initial performance on the digit printing task was depressed by their extreme "nervousness" or anxiety. (Subjectively, this was noted by both experimenters. The high anxiety subjects were "jumpy", they asked more clarifying questions, they made more initial errors and attempted corrections despite contrary directions.) Their extreme nervousness subsided and performance improved (see Table 2) after a few trials, but performance was in turn depressed by accumulating reactive inhibition. Thus, two factors combined to depress high anxiety subjects' prerest performance. The latter portion of the argument is, of course, supported by the fact that they improved so much after rest (dissipated more reactive inhibition) that they were performing as well as the low anxiety subjects. Unfortunately, the interpretation is post hoc and, therefore, questionable; and the lack of a between groups difference on Trial 8 presents some awkwardness.

Nevertheless, it seems clear that both motivation level and anxiety level are factors that need to be considered in making predictions regarding inhibitory potential. To relate this generalization to the findings in our previous studies of inhibitory potential in good and poor achievers further study is needed. With the present subjects, for example, it was noted that there were more poor than good achievers among the high anxiety subjects and more good than poor achievers among the low anxiety subjects; but numbers were too small to permit internal analyses. Probably it would be worthwhile to start with such large pools of high and low anxious subjects that equal-sized subgroups of good and poor achievers could be identified at each extreme. Then it would be possible to examine the interaction, if any, of anxiety level and achievement level in determining inhibitory potential. As it is, one might speculate that the real reason for good and poor achievers' differences in inhibitory potential is that the groups differ in anxiety level or vice versa. [Highly motivated poor achievers did produce results (Otto, 1965) that were remarkably similar to those produced by the present high anxiety subjects.] Another possibility would be to identify subjects in the middle anxiety range (eliminate the top and bottom 20% studied here) and to study the inhibitory potential of good and poor achievers in that range.

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